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British Manufacturers and the Dyestuff Crisis

HOW THE FOREHANDEDNESS OF ONE ENGLISH FIRM HELPED THE GOVERNMENT

WHEN the war broke out Great Britain was at once cut off from the supply of fine chemicals, drugs and dyes obtained from Germany, constituting about nine-tenths of her consumption. It was not until eight months later that the United States faced a similar situation. The degree of enterprise shown by leading British houses, in promptly taking measures to obviate the impending shortage, was most admirable, and it has been continued, without interruption for three years. Possibly it was no more creditable than the corresponding effort, begun in our own land in 1915, and resulting in such a remarkable development of coal-tar chemistry during the subsequent two years.

It must, however, be borne in mind that the British struggle to create an independent artificial dyestuff industry was carried on simultaneously with the nation's gigantic effort to call into existence an army of millions, and wage warfare, on a scale hitherto unknown, almost at its very doors.

Not much has been related in detail of this struggle, but we know that it brought into play all that is finest in British character, in resoluteness and swift adaptation to novel and unforeseen conditions.

The *Manchester Guardian* recently outlined some of the experiences of one of the most prominent English companies engaged in the color industry, Levinstein, Ltd., of Crumpsall Vale, near Manchester. The recital is reproduced here as full of interest and of encouragement to American manufacturers in the same field:—

Immediately on the outbreak of the war, Dr. Herbert Levinstein, from his knowledge of the industry, foresaw that the War Office and the Admiralty would soon be in a very serious position unless the hitherto despised British dye manufacturing trade could rise to the occasion. All the dyes hitherto used for navy blue and military khaki came from Germany. Dr. Levinstein saw that the cutting off of German dyes was a serious matter from a purely military point of view. It is well known that you cannot really begin to train a soldier until you get him into uniform, still less, of course, can you put him in the field. Self-respect, discipline, and spirit are vitally helped by the uniform. This is universal experience, and the psychological reasons are not very obscure. Before you raise armies, therefore, you must have uniforms. For the woolen cloth of which uniforms are made, the

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wool must be dyed before it is even spun into yarn, so that the almost first essential to the production of uniforms is the supply of dyes.

Three or four days after the war broke out Dr. Levinstein visited the War Office and drew their attention to these facts. He pointed out that the khaki dyes that had hitherto been used by War Office contractors came entirely, or almost entirely, from Germany. It was, however, possible to manufacture in this country khaki dyes both for cotton and wool, which, though different in character, would be quite as good and quite as fast as the German dyes. He offered to supply such dyes as quickly as they could be used, and the War Office accepted the offer.

Dr. Levinstein then went to the Admiralty, who were exactly in the same situation as to naval uniforms. The chief color used by the naval contractors had hitherto been indigo and a brilliant alizarin blue, obtainable only from Germany. He explained that he could not pretend to supply this dye, but that he could supply a navy blue dye as good and as fast as the German dye, which had already been used and found satisfactory by the Japanese navy during the Russo-Japanese war. This offer also was accepted.

It is important to observe that in this vital matter the initiative was not with the government, but with the private manufacturer, who from his technical knowledge realized the difficulty in which the War Office and Admiralty would find themselves before many months were over. To that initiative and foresight it is due that, enormous as were the armies we raised and equipped, the War Office never had any trouble in equipping them owing to delay in the supply of dyes. It was not a small undertaking that Dr. Levinstein had given when he promised to supply khaki and navy blue as fast as they were required. It meant a workship revolution and the initiation of a number of manufacturing processes which had never before been carried out in this country. Before the war the dyes offered had been manufactured successfully, but the intermediate products which were the raw material had been obtained from Germany. There was only in stock about six weeks' supply of these raw materials. For further supplies there was no resource but to manufacture on the spot. There were many difficulties and many mishaps, but the firm managed to get the intermediate products manufactured before the German supplies ran out.

It is not too much to say that if it had not been for this initiative on the part of the private manufacturer the War Office could not have been expected to discover the shortage of dyes and all that it meant for many months, and then more months would have gone by while experiments were being made and the manufacture not going. The inevitable result would have been to delay the equipment of Kitchener's armies. As it was, the production of these necessary dyes outran the production of fabrics by the cotton and woolen manufacturers. The surplus was enough to supply American contractors and practically all our Allies. The War Office placed large contracts for equipment with American mills, and the American manufacturers immediately replied that they could only execute the orders, if the Board of Trade would allow them to import the dyes from the British firm.

When the Belgian army was put into khaki, all the dye required was supplied within a week by the same firm. They also supplied within a week all the khaki dye demanded for the Australian army, and all the green dye for the Italian army, when Italy came into the war. The Russian army was equipped largely from America, and the British firm supplied the dye. It also supplied a very large part of the dye for the uniforms of the French army.

Only a manufacturer and a chemist can understand what this enormous increase of output must have meant.

Synthetic Indigo

Another pressing problem was that of artificial indigo. To many Admir-

alty and War Office contractors indigo is the one really satisfactory dyestuff.

A German firm had founded works at Ellesmere Port in 1907. It was equipped with plant for the actual manufacture of indigo, but the necessary intermediate product—phenylglycine—was imported from Germany and was not manufactured in this country at all.

When the war began the Board of Trade considered that the manufacture of synthetic indigo was so complicated that no one in this country was carrying it out. The works were therefore kept going under the German manager and for a time supplied a little indigo, but the output gradually came to a stop.

In August, 1916, the Ellesmere Port works were transferred to Messrs. Levinstein, with the duty of reopening the manufacture if possible. There were many difficulties. The scientific records of the works had been destroyed. Phenylglycine was not to be obtained, and before operations could be begun phenylglycine had to be made. Moreover, a new process for making it had to be discovered, for no chloracetic acid could be obtained for the ordinary process.

The problem was rapidly solved by the chemical staff in the research laboratory and the engineering staff in the factory. Within six weeks the first supplies of phenylglycine on a large scale were produced, and the manufacture of synthetic indigo was begun. This took place in November, 1916, and synthetic indigo came on the market in large quantities.

The plant has run continuously ever since and the present requirements of the country for synthetic indigo are being adequately met.

Novocain

Great Britain, like the rest of the world, was wholly dependent upon Germany for certain drugs of the highest importance in surgery and therefore in war. Among them the

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local anaesthetic novocain and the anaesthetic trypaflavin.

On October 4, 1916, the National Health Insurance Commission asked for ten kilos of novocain, half to be delivered before the middle of November, and the balance by the end of the year. Already by the 31st of October, ten pounds of novocain were ready for delivery. This complicated manufacture was thus definitely established in this country, and novocain was produced in adequate quantities without dependence upon Germany, even for the intermediate product.

Trypaflavin

At the end of October there was a government demand for a few pounds of the new antiseptic trypaflavin. Although the scientific staff was working at high pressure, three chemists were taken off their ordinary work and a careful scientific investigation was made of both of the properties of this class of product and of the best way of preparing it on a large scale in a pure state. At the same time plans were taken in hand for the erection of a plant for its manufacture, which is of an extremely complicated character, involving a very large number of separate and distinct processes.

In March of this year a considerable quantity was put at the disposal of the Medical Research Committee.

Civilian Requirements

At the same time that military and naval needs were being met, as has been described, there was an enormously increased demand for civilian requirements. A dye famine threatened to come in a few weeks after the outbreak of the war.

The great textile industry would have been held up in a month or so if British manufacturers had not proved able to come to their help. Over one hundred different highly-complicated organic products had to be made at Blackley that had never been made in England before, and they had not only to be made, but had to be turned out regularly to meet a huge demand. Some idea of the size of it may be gained from the fact that the expansion of output entailed an expenditure of half a million pounds, and a great deal depended on the promptness with which the thing was done.

Only a chemical manufacturer can have any understanding of the magnitude of the task thus undertaken and successfully accomplished. There were about 900 dyes in use before the war. By conference between the manufacturers and the dyers this list has been reduced to 500 of the most necessary dyes, a figure which in itself is evidence of the extraordinary variety and extent of the regular civilian demand. Every one of these dyes is a complete chemical compound produced from a number of intermediate products, and these products have to be prepared with scientific exactitude. There is no insoluble mystery in the manufacture of these products, and any skilled chemist can make any one of them, given the time and the means. But it is a very big thing

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to make them all in a hurry. It requires chemists and workers of great experience and knowledge; at any time the number of such men available in this country is not large. With the outbreak of war many of the younger chemists went into the army, and many more were engaged in making explosives for the War Office. It is bare justice to Messrs. Levinstein to say that they alone had the courage to attempt the manufacture of the innumerable intermediate products for the manufacture of dyes.

Nobody in England or in Germany probably would have predicted that such a thing could have been done, and done in so short a time. That a British firm should have had the courage to attempt it and the skill and energy to succeed without government help or subsidy is full of real promise for the future of the British aniline dye industry. We know now that we can manufacture aniline dyes and fine chemicals, from the tar upward, without any help from Germany.

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Glove Dyeing

(*In answer to a request for a method for dyeing gloves we are reproducing the following, credit being given to the "National Cleaner and Dyer" and to "Mack," under whose signature it was published.*—EDITOR.)

To many a man in the cleaning and dyeing business the cleaning of colored gloves is a source of continual trouble and worry. This is due to the fact that colored gloves, especially if they are very dirty, become much lighter in color during the cleaning process. Those dyed in tans, browns and greys, the prevailing shades, are generally so affected. Gloves that are badly worn on the finger tips often appear to have lost all of their color on these places after having been cleaned. I believe that these articles, when returned to customers in this condition, cause much disappointment and that many of them are never worn again.

There are tints for coloring gloves to be had, and these give good results as a rule. However, it is possible for the cleaner and dyer to get very good results with the following preparations, providing he cares to go to the trouble to prepare them. By using this method, and with patience and practice, the cleaner will be able to tint many pairs of gloves in a short time and secure results that will please his customers:

Dissolve two ounces of Benzo Brown, four ounces of Diamine Yellow, two ounces of orange and one-half ounce of Gloria Black, or other good black, in one gallon of alcohol Boil the solution for a few minutes and pour into a large bottle which should be kept well corked to prevent loss by evaporation. This is the standard solution with which all brown and tan gloves may be tinted. The shade desired may be obtained by mixing the proper quantity of the stock solution with one part of alcohol and four parts of benzol. The solution should be brushed or sprayed on the gloves. Unless the alcohol and benzol are used in the proportion mentioned above the color will not go on evenly.

Suede and buckskin gloves may be tinted with an all alcohol solution.

Grey gloves may also be done in this manner, using a black to make the grey, and altering to the shade desired with yellow and orange. It is a good plan to keep separate solutions of brown, yellow, orange and black for toning to the different shades one meets in glove cleaning. One ounce of the dyestuff dissolved in a pint of alcohol will provide a quantity large enough for the purpose.

When finishing give the gloves a good rubbing with a velvet cloth. Suede and buckskin gloves should be given a good brushing with a stiff brush.

For dyeing kid, suede and buckskin gloves use one pint of the standard solution mentioned above in one-half of a gallon of alcohol to which has been added one-half of a pint of oleic acid. Allow the gloves to remain in this solution for a day; that is if the gloves are placed in the solution in the morning take them out before leaving the plant for the night. The gloves should be stirred every thirty minutes or so and should be kept under the solution.

When the gloves are taken from the solution they should be well squeezed with the hands and hung up to dry. When dry they should be cleaned off with benzine to which has been added a small amount of oil or vaseline, extracted and dried. The gloves may then be brushed or sprayed to any shade desired.

Grey gloves may be dyed in the same manner. Oleic acid should always be added to the bath, as mentioned above, to keep the gloves from becoming hard.

Manufacture of Phenol

A. Terrisse has found that mixed cresols fused with caustic soda and a little peroxide of lead or copper oxide, heated to 300° until too thick to stir, cooled, pulverized and the powder placed in iron tubes six feet in length and one inch in diameter, the temperature being again raised to 300° and a stream of carbon dioxide passed over the sodium oxy-benzoates that have formed, will produce phenol, which, at the temperature employed, distils off. The caustic, recovered as sodium carbonate, is re-causticized. (*Eng. pat.*, 108,938.)

Historic Logwood

Three hundred years ago when logwood was forbidden for use as a dye the dyers figured it on their books as fustic, the totals of monthly consumption of the latter showing more than came into England in a year. Suit was brought against one of the offenders and action was delayed from year to year by a stipend from members of the dyer's association paid to a prominent politician. The history of crooked practices in the dye trade long outdates the development of the coal-tar industry.—(*Jour. Roy. Soc. of Arts.*)

The Liberty Piece Dyeing & Finishing Co., 44 Morton Place, East Orange, N. J., has been incorporated to dye and finish silk. The incorporators are Walter B. Simpson, E. C. Vannaman, Jr., and Henry C. Whitehead, both of Passaic.

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Difficulties Overcome by American Dyestuff Manufacturers

IN discussing the difficulties which American dye manufacturers have encountered and the manner in which they have solved them, Dr. Louis J. Matos, of the National Aniline & Chemical Company, recently cited the following instances which illustrate the points in question.

The illustrations he used were widely divergent, one being hosiery and the other cloth for automobile tops, cushions, etc. Speaking of the latter, he said:

"They are usually composed of cotton and worsted threads, which means two separate tasks in one for the dyer. It is more convenient for the automobile maker to have the cloth dyed in the piece, so that he may get the exact shade he wants as the styles of the day or the fancy of the buyer may dictate. The color of the cotton must hold against nearly every imaginable vicissitude, and so must that of the worsted. And the colors must not run, because often browns and grays and other mixtures are applied to the different types of thread to provide the required effects.

"Sulphur colors are used for cotton, dyed in a special bath in which glucose plays an important part. Glucose conserves the strength in the wood fibers in the worsted while at the same time it provides that the color dyes evenly upon the cotton. Cotton is stronger when it is wet than when it is dry.

"After the cotton threads have been dyed the required shade and the fabric is thoroughly washed out, it is then cross-dyed with chrome colors on the worsted. Chrome colors are dyed in two baths, in the first of which the material to make the colors is put upon the fibre, and in the second it is developed on the spot where it is needed, by a chemical reaction. Sometimes the wool fibre is bright red after the first bath, and dark blue after the second, which is the shade wanted. It is then very fast. The whole thing must be done without affecting the particular tint of the cotton already dyed. It isn't a very difficult operation; it only requires some good head work. After the worsted has been dyed, the cloth is washed again and dried and finished. Then it goes out into the world."

Speaking of black dyes for hosiery, Dr. Matos said: "We used to wear a great deal of imported black hosiery. When imports stopped the demand grew out of bounds. Look at the census table; see how much was made, how much was imported, and then note the deficit that had to be made up. Then observe, please, that in black hosiery the dyer does not buy the dye; he makes it on the fiber, starting with aniline oil, and that for this he needs time, plenty of time, to get the color on. Then, in the finishing department, they need time and plenty of it to get the unattached color off. Please note these two points.

"Now, time was just the thing that was not allowed. Orders for black stockings and socks came in cascade fashion into the mills, for hundreds of thousands and even half millions of pairs, to meet the market. The dyers were teased and harassed and worried to hurry up at both ends of the process. Dyers are human, and it is a human quality to yield under too much pressure. So time was skimped on putting the color on, which made it come out in the wash. And it was almost skimped in the finishing, which made it crock off on your feet. These are the penalties we pay for too much hurry. And there is the whole story.

"Good hosiery and bad is made of American cotton. We spin and knit and weave here as well as they do anywhere. All the so-called good quality black lisle or cotton hosiery is dyed with

aniline, and we can challenge the world on the quality of this product. It isn't new in this country. Ellwood Hendrick made it in Albany back in 1883. The point is that dyeing is an art, and please remember also that there are great artists among the American dyers. But when, to capture a big order some man of business demands deliveries before they can properly be made, the quality is bound to suffer.

"Now I have been up to my neck in problems of this sort for a good many years and I have watched the growth and development of textile industry in this country with intense interest because my whole life is bound up in it. And one of the most comforting things has been to observe of late how one native establishment after another has resolved to stand out for quality and refuse to put its name upon anything that is not supreme in this respect. The best hosiery mills to-day will give you a negative reply if you ask for deliveries at the expense of quality.

"Another dye widely used in hosiery is sulphur black. It is used on the cheaper grades of cotton stockings and socks. It stands up well in the light, as you see by those tests, and it is a grand dye to stand washing. Curiously enough, it is also used, by processes familiar to the dyer to produce beautiful brocade effects on mixtures of cotton and silk goods. But that is another story."

Azo Colors Containing Chromium

DR. GADIENT ENGI and Dr. Carl Jagerspacher, of Basle, Switzerland, assignors to the Society of Chemical Industry, describe (Amer. Pat. 1,242,536, of Oct. 9, 1917), a new class of chromium azo dyes, yielding fast dyes on wool and other animal fibers. They are derived from ortho-oxy-azo dyes, a group of colors from which Dr. Jagerspacher and his colleagues have already elaborated several categories of interesting new dyestuffs.

In the present case the process consists essentially in treating an ortho-

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aminophenol compound with a chromium compound in a hot aqueous medium, diazotizing the resultant product, combining the resulting chromium compound of an orthooxydiazobody with a naphtholic compound and treating finally the thus obtained half chromated orthooxyazo-dyestuff in a hot aqueous medium with a chromium compound.

The following example illustrates the process: 15.4 parts 4:2:1-nitroaminophenol are heated with 350 parts water, 13.6 parts crystallized sodium acetate and 11 parts chromium fluoride for 3 to 4 hours at 100° C. in a vessel provided with a reflux cooler. After the mass is completely cooled, the residue is separated by filtration and the filtered liquid saturated with common salt. The easily soluble chromium compound of 4:2:1-nitroaminophenol separates progressively as a yellow-brown precipitate. It is diazotized in the known manner and the resulting diazobody is combined with 1:8:3:6-aminonaphtholdisulfonic acid in a soda-alkaline solution. The obtained dyestuff solution is filtered hot and the half chromated dyestuff is precipitated from the filtered liquid by adding common salt. The dyestuff can, if desired, be purified by redissolution. 2.5 parts of this half chromated dyestuff are added to a solution of 2.5 parts chromium fluoride in 60 parts boiling water. The violet solution turns quickly to blue-violet and after further boiling to blue-green. After a boiling for three-quarters of an hour, 6 parts crystallized sodium acetate are added, and the liquid is separated hot by filtration and suction from the undissolved residue, evaporated to about 25 parts and the chromium compound is precipitated from it by adding 6 parts common salt. After the mass has been allowed to stand for a long time, the chromium compound is separated by filtration and suction, slightly washed and dried. It dyes wool and other animal fiber in an acid bath pure green tints, very fast to alkalis, light, washing, fulling and potting, dissolves in water to a green-blue solution, in concentrated sulfuric acid to red-blue solutions and in alcohol to green-blue solutions.

If picramic acid serve as a starting point the resultant dye is a yellowish-green. A violet dye is obtained from 2:1:4 amino-phenol-sulfonic acid.

The reaction is one susceptible of considerable variation by altering the constituents. Other soluble chromium salts can be employed, but the fluoride seems preferable.

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Export of American Dyes

FIGURES are eloquent! They testify in an imposing manner to the swift growth of our domestic manufacture of artificial colors. The reports of the Bureau of Foreign and Domestic Commerce show that during the first ten months of 1917 were exported dyestuffs valued at $12,500,000. Four years ago this sum more than covered the invoice value of our imports and was four times the value of our annual domestic output. We are now meeting the bulk of our home needs for colors and shipping dyes to twenty-one foreign countries.

Prices are so inflated at present that the sum stated above may not represent in actual quantity more than we were wont to manufacture annually. The trend of production is, however, unmistakable. It speaks volumes for the energy and enterprise displayed by the American chemical industry in building up the new branch and in utilizing to the utmost the opportunity afforded by the great international convulsion.

British Color Industry

The *Journal of the Royal Society of Arts* is authority for the statement that the color supply of England is still far from satisfactory so far as quantity and variety are concerned. Exploitation has caused manufacturers for the most part to supply consumers only under restrictions against re-sale. Dyes, however, do filter into the hands of dealers. One case traced up showed color, delivered at 9s. by the maker, to have been re-sold at 36s. The first named price gave a handsome profit. Unless this condition is remedied the German combine will profit after the war.

Still

An apparatus for the distillation of light products such as benzene is described recently in *Comptes Rendus.* It is used as the official method of military aeronautics, for oils intended for aviators. The advantages of the apparatus are: (1) direct regulation of the rapidity of distillation by a stopcock; (2) it is possible to distil each drop as it falls without usual excess heat on the residue which is the cause of decomposition; (3) each vessel of the six in line is protected from the air by its own vapors and as baths are of the same nature as the fractions obtained, so variations of atmospheric pressure are without sensible influence on the fractionation; (4) traces of water may be detected and appear in fraction 90°-110°. Volumes can be read off directly by graduated cylinders or otherwise.

The method is applicable to other volatile products, selecting baths and intervals of temperature according to the bodies to be separated. For some mixtures it is well to separate certain fractions first, then repeat parts of operations. This should be done with benzene, alcohol, etc.

Solvent Properties of Emulsions, Theory of Dyeing in a "Broken" Soap Bath

P. Sisley has made some very interesting experiments on the concentration of colloids in a foam or similarly in the emulsified portion of an immiscible solvent. Suitable colloids are azo dyes from the Safranine group. Two hundredths of a gram of dye per liter of water is a convenient strength of solution. When made acid with acetic acid and shaken with chloroform the dye collects at the layer between the liquids and on standing, as emulsion is destroyed, the dye concentrates in the aqueous layer above the chloroform

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and gradually diffuses into the acid water. This property of emulsions to dissolve more than the normal amount of a colloid explains dyeing processes used. Tri- and tetra-nitro-diphenylamines do not dye silk from an aqueous suspension but from a "broken" soap bath. The use of oil emulsions in dyeing cotton and leather, as well as certain facts in physiology and therapy, can be explained by this phenomenon. (*Bull. Soc. Chim.*, 1917, 21, 155.)

Native Chinese Indigo

DISCUSSING the growth of native indigo in Fukien Province, China, a recent consular report for this district says:

Until 20 or 25 years ago the southern part of Fukien Province, in common with practically every other part of China, produced its own indigo. Then importation from abroad started, principally from Germany and Belgium, and the amount grown locally gradually diminished as the amount imported increased. The reason for this, so far as this consular district is concerned, is that the synthetic indigo from abroad was found far more efficient for dyeing purposes than the vegetable product grown locally. Chinese merchants admit that one picul (133⅓ pounds) of German artificial indigo would do the work of 20 piculs of the native product. This fact explains why the importation could have occurred, for the synthetic indigo was much more expensive, prior to the war, costing from $35 to $40 United States currency per picul. The native product fluctuates widely in quality and correspondingly in price. At present the market price is from $2 to $8 United States currency for 133 pounds.

The war, with its attendant compulsory cessation of imports from Germany, has revived the domestic culture of indigo to such a degree that now this consular district is raising enough of the vegetable product to satisfy its own needs. Customs returns for 1915 and 1916 do not mention indigo as having been imported into Amoy, though in 1913 there were 230 tons imported to a value of approximately $94,500 and in 1914, 236 tons, valued at approximately $87,000.

The three centers of production in this consular district, all of which incidentally are places where the manufacture of native cloths is of some importance, are Changchow, Chuanchow, and Tungan. Prior to 1914 these three cities all depended largely on imported synthetic indigo, but circumstances have compelled them to grow the vegetable product for their own needs, and at present they not only are doing this but there is also a small surplus for export to neighboring towns.

There is nothing difficult in the culture of vegetable indigo. The crop is generally planted early in June and requires approximately four months to mature. There is little work required other than the initial preparation of the ground and the harvesting of the grass. To make the liquid indigo the grass is placed in large casks and permitted to soak for several days. Then lime is added, the grass removed, and after soaking three or four days more the

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water gradually is drained off. During this draining process the liquid must be well stirred up each day.

One unsuccessful effort has been made to import indigo into this consular district from the Philippine Islands. Though the strength of the imported indigo was admittedly greater than that of the native, the price at which it had to be sold was so much higher than that asked for the native product that the experiment proved a failure.

Local merchants say that the southern part of Fukien Province is now producing sufficient indigo for its own needs, and that even after the war is over Belgium and Germany will not find the same market for their synthetic product that existed formerly.

Development of the Dyestuff Industry in Japan

AN interesting insight into the development of the dyestuff and heavy chemical industry in Japan since the outbreak of the World War was afforded by the exhibit of the Takamine Laboratories, Incorporated, at the recent Textile Exhibition. This concern operates both in New York and Tokio and has American factories at Clifton, N. J.

According to information given out by this concern many of the factors which brought about the quick development of the dye and heavy chemical industry in the United States also operated in Japan, which has a large and important textile trade, being one of the largest purchasers of American raw cotton.

Japan before the war was a large customer of the German dyemakers, but when the yellow kingdom threw in its lot with the Allies this market was instantly closed and the Japanese chemists embarked on much the same course of study which has had such splendid results in the United States.

Regarding Japanese dyes, latest reports show a great advance in this field and many colors are being produced in large quantities, but on account of Federal ruling none of these may be imported, due to the necessity of home consumption.

Among the colors produced on a commercial scale by the Takamine Laboratories in Tokio are benzo fast red A, congo red, benzo purpurine, methanyl yellow, chrysophenine yellow, Nippon direct black, Nissen dark blue, Nissen indigo (type), synthetic indigo, Nippon direct blue, Nissen black, methylene blue, methyl violet and rhodamine B. The Nissen colors are originals, developed in their own laboratories, and are especially designed for Far Eastern requirements. They refine their crudes from by-product coke ovens and make their own sulphuric acid, oleum, hydrochloric and nitric acids, electrolytic caustic soda and chlorine; and have concentrating plants for the recovery of sulphuric acid.

While many of the products which this company is exhibiting pertain more to the chemical and pharmaceutical industries than to the textile industry, they are of interest to show what great advancement has been made in Japan.

Progress of Dyestuff Manufacture in Great Britain

SPEAKING of the development of the British dyestuff industry, the London *Chronicle* of April 23rd, says:

"The British Dyes Company, which, it will be remembered, was promoted at the instance of the Board of Trade and with the assistance of the Treasury to take the position held before the war by the Germans as the main providers of synthetic dyes for British textiles, has now been at work for over two years, and is able to report good progress.

"The works at Huddersfield are a small town, and are still expanding. In nearly everything but the food and clothing of the workpeople they are self-contained and self-sufficing—they manufacture most of the more or less worked-up essentials of the industry within their own 500 acres. Necessar-

ily they are situated in an area which was selected for its neighborhood to the raw materials—suitable water, coal and crude coal tar—and to ports at which such imported raw materials as iron pyrites and nitrate of soda can be received. By their magnitude and their situation the works promise to fulfill the high task assigned to them by the State.

"The directors, in the policy which they have pursued have gone to the heart of the German success. It was not by making dyes, but by making the "intermediates" from which dyes are made, that the Germans gradually but surely forced the whole world—America as well as Europe—to depend upon them in one phase or another of this great industry. Dyemaking itself is relatively a simple and inexpensive process once you have hit upon the "intermediate," and for 30 years the German chemists have devoted themselves patiently and painfully to "intermediates," with, in the end, enormous triumphs.

Germans Eclipsed

"We other countries all made our own dyes, but only upon German sufferance, and we should have had to take the dyes themselves from Germany in time of peace if that country had chosen to stop its export of intermediates. Now the intermediates are being made at Huddersfield, and the most elaborate and expensive plant used in the whole undertaking is employed in this essential branch, which, indeed, absorbs eight-tenths or more of the capital outlay. In the laboratories, where a hundred chemists are at work, compounds have been devised and dyes produced even beyond the ingenuity of the Germans, for it is to be borne in mind that the British Dyes Company had not to start at the very beginning, but, roughly, where Germany left off in August, 1914.

"Besides the two large laboratories there is in the works a complete installation of miniature dye-making plant which, though it is small enough to be got into one room, works with all the appearance of doing the actual thing. It is used for experiments, for trying new colors, for bringing the theorist into constant contact with the practical.

"A company which is able to manufacture its heavy chemicals like nitric acid and fuming sulphuric acid, its intermediate chemicals such as benzidine, beta-naphthol, and synthetic phenol, and its fine chemicals such as the colors of the dress materials displayed in the windows of Oxford-street, is obviously in control of a pretty complete organization. The appreciation of the dye-consuming industries is demonstrated by these two facts—the company in the last two years has been enabled to pay the maximum dividends upon its share capital that it is permitted to pay, and considerable extensions of plant are in contemplation."

Aniline Black

ACCORDING to a recent invention of D. de Nagy of London, England (Amer. Pat. 1,250,289 of Dec. 18, 1917), ammonium molybdate can be used effectively in the operation of forming aniline black, replacing the catalysts hitherto in use. The most valuable of these catalysts are ammonium vanadate and salts of cerium, copper and iron. One pound of the vanadium salt serves to bring about the oxidation of 270,000 pounds of aniline salt.

The following example illustrates the process in the case of producing black or black-blue color direct on the fiber:

A bath is made up of:

	Grams
Chloraniline, *o*- or *p*-	5
Hydrochloric acid (18° Bé.)	25
Ammonium molybdate	2/100
Diphenylamine	1/2
Potassium bichromate	5
Potassium chlorate	1 8/10

dissolved in one liter of boiling water. In this bath, which is preferably at a temperature of 70° C., silk, wool, or cotton is immersed for an hour. This gives the best results, but the operation may be also conducted cold throughout, or the temperature may even be

raised to the boiling point. The only subsequent treatment of the fibers is to immerse them in dilute caustic soda lye, which gives the best deep black and black-blue shades. The fibers exhibit a much more intense shade which possesses decidedly increased fastness to the action of light.

Pastes of various colors are likewise prepared by the use of the molybdate, which can be employed directly in forming dye baths. All yield products of notable fastness to light. The following are the directions for preparing and using a red dye:

	Parts
Hydrochloric acid (18° Bé.)	5
Aniline oil	5
Para-nitraniline	1
Nitrobenzene	2
Ammonium molybdate	3/100

These constituents are boiled together and kept at a temperature of 200° to 230° C. until the mass is a paste. This paste is then dissolved in hot water and when cool is precipitated with caustic soda.

In use, 5 grams of the red dye may be dissolved in 1 liter of hot water at a temperature of 70 to 80° C., and the solution is made slightly acid with acetic acid. The stuff to be dyed is immersed in the bath, the temperature being maintained for about half an hour to one hour, and is then rinsed in cold water and allowed to dry.

Improvements in Dyeing Machines

THOMAS and Walter W. Sibson, of Philadelphia, in recent patents (Amer. Pats. 1,246,835 and 1,246,836, of Nov. 20, 1917) outline some interesting developments in the construction of dyeing machines. The first seeks to obviate the difficulties arising from the direct admission of steam at the bottom of a dyeing tank, causing the liquid to boil over, producing often streaks in the color on goods, and preventing uniformity of temperature throughout an operation. Essential features of the improved device are means for introducing steam into the dye liquor before it enters the tank, and a centrifugal pump, which maintains a constant circulation of the liquor in the treating bath, and in consequence a uniform temperature. The bath contains the customary rotatory cylinder with compartments for the articles to be dyed.

In the second device heat is provided by means of a closed system of steam pipes, located in a large pipe, with many openings, placed at the bottom of the dyeing machine. A pump maintains a constant circulation, drawing the liquor from the bath through the large pipe, where it is brought to the proper temperature, and returning it to the upper part of the machine.

The patents are assigned to the Philadelphia Dyeing Machinery Co.

Artificial Light Changed Into Daylight

A new lens for changing artificial light into daylight is on exhibition in the Textile Show and we give a brief description of it in the hope that mill men may be interested.

It is a specially prepared lens that fits into the bottom of any standard electric light reflector and, we are told, can be adjusted in a few minutes.

It seems to us to be very practical indeed, as it would undoubtedly mean added production, accurate matching of colors, and alone all would eliminate eye strain.

CLEARING HOUSE
FOR
COLORS

MAY SPECIALTY:
Brilliant Fast Sky Blues

DYE EXCHANGE CORPORATION
141 BROADWAY NEW YORK

Bring Us Your Dyestuff Problems

The application of dyestuffs to textiles is as important as their production. The technique of this branch of the color industry has for years commanded the best talent among those dyestuff distributors who have catered to the highest class of trade.

An intimate knowledge of the possibilities of every dyestuff is often necessary to meet the particular requirements of the consumer. Dyeing is a chemical, not a mechanical process, and the variation of local conditions, due to differences in quality of water, steam and chemicals, makes the dyehouse problem an individual one.

Such problems are welcomed by the technical department of this company, which is manned by chemists who have been picked because of their knowledge, practical experience and demonstrated ability. We have long maintained well-equipped laboratories at our different offices for this purpose, and invite inquiries and extend, without any obligation on the part of our customers, our services to all who stand in need of them.

National Aniline & Chemical Company

INCORPORATED

21 Burling Slip, New York